REMARKS/ARGUMENTS

The Claim Amendment

Claim 6, a dependent claim, is amended to refer to "the multi-wavelength photonic oscillator" as opposed to "the multi-wavelength photonic modulator" to be consistent with the amendment made to claim 1 in the last response.

The Prior Art Rejections under 35 USC § 103 based on Akiyama (US 6,661,974) and Yao (US 5,929,430)

The Examiner rejects claims 1, 6, 11 and 38 asserting that those claims are obvious over Akiyama in view of Yao. This rejection is improper for at least three reasons:

First, **Akiyama fails to teach all of the limitations which the Examiner asserts it teaches**. So even if it were obvious to combine Akiyama and Yao (which is denied, see the applicant's second point below), the combination asserted by the Examiner fails to teach all of the limitations of claims 1, 6, 11 or 38.

Claim 1 recites, *inter alia*, "an optical wavelength multiplexer for combining the light emitted by the plurality of lasers at an output thereof as a set of optical wavelengths". The Examiner asserts in the Official Action that this limitation is met by Akiyama at col. 20, line 4-7. At that point Akiyama states:

> "The optical transmitter 10 includes the plurality of light sources 11_1 -11_n having different wavelengths (λ_1 -λ_n) and constituted by a plurality of discrete semiconductor lasers or a semiconductor array laser; the multiplexer 12, which can comprise an arrayed waveguide grating, a star coupler or the like ..."

Note that Akiyama doea not teach "combining the light emitted by the plurality of lasers at an output thereof as a set of optical wavelengths". Indeed, reading further in col. 20 of Akiyama makes it clear that the Akiyama disclosure teaches away from "combining the light emitted by the plurality of lasers at an output thereof as a set of optical wavelengths" as required by claim 1.

Akiyama's optical transmitter 10 supplies light of a single signal wavelength into its external modulator 12b. Although the transmitter has many lasers, emitting at many different wavelengths, light from only one laser and of only a single signal wavelength is coupled at a given time into the modulator 12b. At column 20, lines 35-43, Akiyama further describes the same embodiment noted by the Examiner, stating that "the output wavelength controller 13 (which receives the feedback signal from the loop) causes the light sources 111-11n to emit light successively at prescribed intervals. As a result, the light multiplexer 12 successively inputs light of wavelengths λ_1-λ_n generated by the plurality of light sources to the external modulator 12b..." This means that light of only a single signal wavelength and supplied from a single laser is provided into the modulator 12b at any instance of time. Actually, Akiyama also combines a second, monitor, wavelength with the first, signal, wavelength and then supplies both wavelengths to the modulator. In contrast, claim 1 requires that the optical wavelength multiplexer combine "the light emitted by the plurality of lasers at an output thereof as a set of optical wavelengths". No "combining the light emitted by the plurality of lasers at an output thereof as a set of optical wavelengths" occurs in Akiyama!

Note that the other embodiments of Akiyama's patent likewise involve supplying a single selected wavelength of light to the modulator and to the optical transmission line 30. See, for example, column 9, lines 61 to column 10, line 5. Also, see column 10, lines 55-66 as well as column 11, lines 58-67.

Since Akiyama does not meet limitation quoted above, the rejection based on Akiyama and Yao is improper.

Second, it is NOT obvious to combine Akiyama and Yao as proposed by the Examiner. The function of the feedback loop of Akiyama is to select the desired single signal wavelength; this feedback loop of Akiyama is a logical or control loop rather than being an analog feedback loop, like the oscillator loop of Yao. Thus, there would be no reason to use the analog feedback loop of Yao as the logical, control feedback loop of Akiyama. The Examiner seems to believe that all feed back loops are created equal and that one can be interchanged for another willie-nillie. This is far from the case.

Yao's feedback loop is an analog loop that provides an analog electrical signal to modulate the gain of the optical amplification element in a ring laser (Figure 2, column 5, lines 7-18), the drive current of a laser diode (Figure 15a) or the transmission through an optical modulator 1610 within a laser cavity (Figure 16, column 11, lines 13-18). In all of these cases, the laser structure is being modulated in a mode-locked manner so that its output is a train of light pulses (column 6, lines 7-11). This means that laser light is present sometimes and absent at other times. However, an objective of Akiyama's disclosure is to avoid such a temporal interruption of the laser light (see Akiyama column 3, lines 43-65). Furthermore, the production of a pulsed laser output by the approaches of Yao is very different from the selection of specific laser output wavelengths by the approaches of Akiyama. Thus, one would not be motivated either combine the loop of Yao together with the loop of Akiyama, or use the loop of Yao instead of the loop of Akiyama.

Feedback loops for control purposes have gains less than unity. Otherwise one tends to get undesirable oscillations or instabilities in a control

system formed by such a feedback loop. Feedback loops for generating oscillations tend to have loop gains greater than unity since in that case oscillations are desirable.

Third, claim 1 requires "an optical modulator arranged in a feedback loop". Akiyama's modulator 12b is not located in his feedback loop, rather Akiyama's modulator 12 is located between his multiplexer 12 and the optical receiver 20. Akiyama's feed back path starts downstream of his modulator 12b and not in his "outgoing optical transmission line 30".

In contrast to Yao, and to Akiyama, in applicant's disclosure, the feedback signal is directed only to the modulator, which is separate from the laser. Thus, with applicant's approach, the modulator is modulated by the electrical feedback signal from the feedback loop. However, for Akiyama, his modulator 12b is on/off modulated by a 40 Gbps signal (see, for example, Akiyama column 17, lines 62-65), which is not supplied by means of his feedback loop. Yao does not show any optical modulator that is separate from a laser optical feedback loop or laser cavity. In summary, the feedback loop in applicant's disclosure modulates the optical modulator of the multi-wavelength photonic oscillator and claim 1 specifically places the modulator in the feedback loop. However, the feedback loops of Akiyama and Yao either control (as in Akiyama) or modulate (as in Yao) their lasers and not any optical modulators separate from their lasers.

Claim 1 and the claims dependent thereon are patentable over Akiyama and Yao.

The Prior Art Rejections under 35 USC § 103 based on Katagiri (US 7,050,723), Graves (US 7,079,772) and Wagner (US 5,450,223)

The Examiner rejects claims 24, 31, 39 and 40 asserting that those claims are obvious over Katagiri in view of Graves. This rejection is improper for several reasons.

Regarding Claims 24 and 31, the Examiner continues to refer to Figure 3b of Graves and asserts that Graves' multicarrier optical signal source 100 produces both multiple optical carriers and multiple modulation sidebands. The discussion in Graves pertaining to Figure 3b (in column 12, lines 4-19) only mentions channel center frequencies $F_{ch,8}$, $F_{ch,9}$, $F_{ch,10}$ and system frequencies F^*_8, F^*_9, F^*_{10}. There is no mention of any modulation sidebands. Thus, the Examiner, again, has not identified where Graves teaches that modulation sidebands emanate from his signal source 100. The limitation "multi-wavelength photonic oscillator producing an optical output comprising multiple optical carriers and multiple modulation sidebands" is not met by Graves.

On page 11 of the official action, the Examiner points to the solid lines on Fig. 1 of Graves and says "Graves does indeed discuss about modulated optical carriers coming from certain wavelength groups passing through the switch...". Let us look more closely at this assertion. This assertion has nothing to do with that which is generated by source 100 or that which is shown in Fig. 3b relied upon by the Examiner when making the rejection. The Examiner is basically saying on page 11 of the official action, that one or ordinary skill in the art would take all of the circuitry shown in Fig. 1 of Graves as a whole (and not just element 100) and use the outputs of Graves' switch 120 to replace the laser oscillators 20 shown in Fig, 2 of Katagiri. But why would one do that? Note that the laser oscillators in Katagiri each supply two frequencies (λ11 and λ12 in the case of the upper most laser oscillator shown in Fig. 2). Those carriers are then

modulated by signal DATA at an optical modulator 21. Now why would one skilled in the art art replace those bi-frequency laser oscillators 20 (producing, as a specific example, two distinct frequencies or, as a general case, multiple distinct frequencies) with that which is shown in to in Fig. 1 of Graves? Graves switch 120 does not produce bi-frequency optical signals, rather it produces data modulated signals (see Graves column 5, lines 13-18)." So according to the Examiner's analysis, one skilled in the art would be motivated to modulate the carriers generated by Graves multi-carrier optical signal source 100 twice with data! Once at Graves elements 110 and then again at Katagiri's optical modulators 21! With all due respect, it is submitted that that is about the last thing as person skilled in the art would want to do. Instead, Graves specifically teaches the use of different wavelength groups to distinguish between the data modulated optical carriers supplied to an element 110 and the unmodulated optical carriers that are supplied to the same element 110 to subsequently be data modulated by the element 110, in order to prevent the interference of unmodulated and data-modulated carriers from occurring (see Graves column 5, lines 40-46 and column 5, lines 13-18).

In short, in the rejection in chief, the Examiner focuses on element 100 of Graves and asserts that it could be used in the apparatus of Katagiri. The reasonableness of this assertion does not need to be tested since that combination does not meet the claim language as previously pointed out.

In response, the Examiner focuses instead on a combination of elements 100, 110 and 120 of Graves to try to get closer to the claim language. But it makes absolutely no sense to try to replace laser oscillators 20 in Katagiri with the combination of elements 110, 110, & 120 of Graves since people skilled in the communications art do not subject carriers to multiple stages of modulation by

data signals due to the complex intermodulation distortion products which would certainly be generated.

Finally, the Examiner asserts that the motivation to combine Graves and Katagiri is to "reduce cost and enhance controllability". This is conclusory reasoning. There is no cost reduction in replacing Katagiri's simple bi-frequency lasers with Graves complex structures and there is no enhancement in controllability when you end up with unmanageable intermodulation distortion products.

Allowable Subject Matter

The Examiner is again thanked for the indication of allowable (or allowed) subject matter in terms of claims 18-23, 25-28 and 32-35. However, for the reasons given, it is believed that all of the claims pending in this application are allowable over the cited art.

Withdrawal of the rejections and allowance of the claims are respectfully requested.

* * *

The Commissioner is authorized to charge any additional fees which may be required or credit overpayment to deposit account no. 12-0415. In particular, if this response is not timely filed, then the Commissioner is authorized to treat this response as including a petition to extend the time period pursuant to 37 CFR 1.136 (a) requesting an extension of time of the number of months necessary to make this response timely filed and the petition fee due in connection therewith may be charged to deposit account no. 12-0415.

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